

## IMPACT OF NEEM IN CASE OF ANTIMICROBIAL ACTIVITY ON SINGLE JERSEY COTTON FABRIC

MD. MAHAMUDUL HASAN<sup>1</sup>, SUTAPA CHOWDHURY<sup>2</sup>, KAWSERPARVEEN CHOWDHURY<sup>3</sup>,  
SHILPI AKHTER<sup>4</sup> & MD. SHAKIRUL ISLAM<sup>5</sup>

<sup>1</sup>Lecturer, Department of Textile Fashion & Design, Bangladesh University of Textiles, Bangladesh

<sup>2</sup>Assistant Professor, Department of Textile Fashion & Design, Bangladesh University of Textiles, Bangladesh

<sup>3</sup>Assistant Professor, Department of Wet Process Engineering, Bangladesh University of Textiles, Bangladesh

<sup>4</sup>Associate Professor, Department of Fabric Engineering, Bangladesh University of Textiles, Bangladesh

<sup>5</sup>Lecturer, Department of Wet Process Engineering, Bangladesh University of Textiles, Bangladesh

### ABSTRACT

*The research based on the development of anti-bacterial fabric using Neem. An antimicrobial agent extracted from the leaves & bark of Neem tree (Azadirachta indica) was used for adding an antibacterial property to the blend fabric. Alum was used as mordant in dyeing. Different concentrations were used to treat the fabric with the antimicrobial agent along with the cross-linking agent. The antibacterial property was examined by AATC method against the growth of gram-positive & gram negative bacteria respectively. The finished fabrics have shown significant characteristics in prohibiting the growth of Gram-positive bacteria. The finished fabrics were examined to know the fastness properties. In this study fastness to washing and rubbing were assessed. Antimicrobial activity against Gram-positive bacteria was retained up to four machine washes and decreased thereafter.*

**KEYWORDS:** Antibacterial, Neem, Extract & Dyeing

**Received:** May 07, 2018; **Accepted:** May 28, 2018; **Published:** Jun 25, 2018; **Paper Id.:** IJTFTAUG20181

### INTRODUCTION

The extracted dye from Neem leaves & bark has been explored for its application in papermaking. Natural dyes are obtained from natural sources such as plants, insects, and minerals. Among all the plant-based dye sources are bark, flowers, seeds etc. Bark, leaf and floral dye sources are more important for textile dyeing as it provides dye fragrance, health protection. Neem (Azadirachta indica) commonly called 'Indian Lilac' or 'Margosa', belongs to the family Meliaceae, subfamily Meloideae, and tribe Melieae. Neem is the most versatile, multifarious trees of tropics, with immense potential. It possesses maximum useful non-wood products (leaves, bark, flowers, fruits, seed, gum, oil and neem cake) than any other tree species. These non-wood products are known to have antiallergenic, anti dermatic, anti feedent, antifungal, anti-inflammatory, antiscabic, cardiac, diuretic, insecticidal, larvicidal, nematicidal, spermicidal and other biological activities. Because of these activities neem has found enormous applications making it a green treasure. Neem tree (Azadirachta indica), one of the richest sources of biologically active compounds, belongs to the Meliaceae (Mahogany) family and is abundantly found in the Indian subcontinent.[1] L. Nagarajan said in his paper that Neem contains a very important compound named "NIMBUS" (C<sub>30</sub>H<sub>36</sub>O<sub>9</sub>) & it has the ability to act against bacteria.[4]

Neem (Azadirachta indica) can be a source of colorant for smart textile products as it has been declared

non-toxic ingredients in cosmetics, agriculture, Ayurveda and textile dyeing industries.[2] Neem bark contains tannin and leaf has antibacterial properties.[3] So it is useful in tanning and dyeing a number of smart textile products.

So many naturally extracted dyes from plants source performs excellent antimicrobial properties. Neem is one of them. In this study develop the antimicrobial property on single jersey cotton fabric. Natural dyes are environment friendly and show many advantageous properties than their synthetic counterparts.

## MATERIALS

A single jersey cotton fabric is desized, scoured and bleached fabric is used to carry out the study. Fresh green Neem bark & leaves are collected from a garden. Following materials are required for this research:

- Cotton fabric (single jersey knitted fabric ready to dye)
- Dyestuff ( neem barks and leaves )
- Chemicals.

## SELECTION OF FABRICS

100% cotton woven or knitted fabric can be used. The single jersey cotton knitted fabric is used in this research. Cotton fabric is free from toxins & irritants.

## DYE-STUFF

In this research Neem barks and leaves are used as dye-stuff. Neem is one of the most innovative natural dye in textile dyeing.



**Figure 1: Neem Leaves and Bark**

## CHEMICAL USED

- Mordant (Alum  $KAl(SO_4)_2 \cdot 12H_2O$ )
- Glauber salt ( $Na_2SO_4$ )
- Leveling agent (HX-830 Pergal O )
- Sequestering agent (Ethylene Diamine Tetra Acetic acid EDTA)

- Wetting agent (Felosen Jet)
- Caustic soda (NaOH)

## DYE EXTRACTION AND PREPARATION

### Neem Leaf Dye Extraction

The leaves (1000 gm) of neem plants (*Azadiracta indica*) were collected and washed under flowing water repeatedly to remove dust particles and soluble impurities and were allowed to dry at sunlight till the leaves became crisp, they were crushed into finer pieces. After drying, the weight of leaves was 650 gm. Then crushed leaves were boiled with water (2000mL) and dye solution was collected.

### Neem Bark Dye Extraction

Neem barks (1000 gm) were collected from healthy neem tree and cut into small pieces then dried. After drying at the ambient environment, the weight of dried barks was 800gm. Then small pieces were crushed and made power and boiled with water (2500 mL). Thus dye solution was made and preserved for dyeing.

### Dye Recipie

Dye solution (dye liquor 500mL + water 500mL) - 1000 mL

Glauber salt - 10 g/L

Wetting agent - 1 g/L

Levelling agent - 1 g/L

Sequestering agent - 1 g/L

Caustic soda - 2 g/L

M L - 1 : 20

Fabric sample - 50 gm

### Dyeing Process Curve

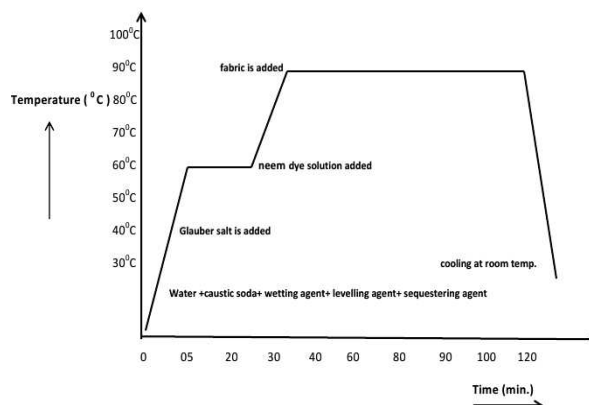


Figure 2

### Dyeing Process (Without Chemicals)

Fabric sample can be dyed with neem bark and leaf extracted dye solution without using any chemical. Only mordanting is done for dye affinity and no chemical is used for dyeing process. Dyeing process is same as the previous dyeing.

### Dyeing Process Curve (Without Chemicals)

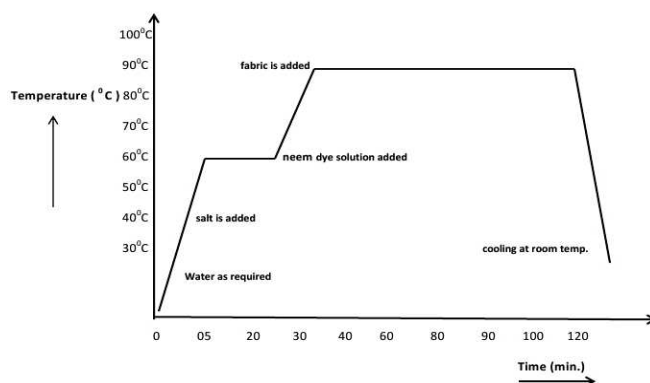


Figure 3

### After Treatment

After dyeing, the dyed fabrics were slightly squeezed. Without rinsing, the dyed samples were dried in normal atmospheric condition without direct sunlight.



Figure 4

## RESULTS AND DISCUSSIONS

The dyed samples were rubbed in James Heal Crockmaster. The sample was placed on the arm and weighted to provide a constant 9N load on the sample at all times and a mechanical counter keeps track of completed 10cycles. After

completion of the Rubbing fastness, samples are dried. Then it is compared with a Gray Scale for Staining of color

### COLOR FASTNESS TO RUBBING TEST RESULT(COLOR FASTNESS TO RUBBING: ISO 105X 12)

Dyed Fabric Sample (With Chemical)

Dry Rubbing

Direction	Neem Bark Dyed Fabric		Neem Leaf Dyed Fabric	
	Grade	Rating	Grade	Rating
Wales direction	5	Excellent	5	Excellent
Course direction	5	Excellent	5	Excellent

Wet Rubbing

Direction	Neem Bark Dyed Fabric		Neem Leaf Dyed Fabric	
	Grade	Rating	Grade	Rating
Wales direction	4	Very good	4	Very good
Course direction	4	Very good	3	good

Dyed Fabric Sample (Without Chemical):

Dry Rubbing

Direction	Neem Bark Dyed Fabric		Neem Leaf Dyed Fabric	
	Grade	Rating	Grade	Rating
Wales direction	4	Very good	4	Very good
Course direction	3	Good	3	Good

Wet Rubbing

Direction	Neem Bark Dyed Fabric		Neem Leaf Dyed Fabric	
	Grade	Rating	Grade	Rating
Wales direction	2	Fair	4	Very good
Course direction	2	Fair	4	Very good

Comparative analysis of rubbing test result of neem bark dyed fabric sample & leaf-dyed fabric sample, leaf-dyed fabric sample gives more positive result than bark dyed fabric sample.

Antimicrobial Property Test: (AATC method)

Bark dyed sample

Organism	Sample without wash (Bacteria Formation)	Sample after 1 wash (Bacteria Formation)	Sample after 2 wash (Bacteria Formation)	Sample after 3 wash (Bacteria Formation)	Sample after 4 wash (Bacteria Formation)
<i>E.coli</i>	$1.5 \times 10^7$	$7.5 \times 10^7$	$6.7 \times 10^8$	$1.3 \times 10^8$	$1.5 \times 10^9$
<i>S.aureus</i>	$2.42 \times 10^7$	$3.7 \times 10^7$	$5.4 \times 10^8$	$1.7 \times 10^8$	$1.5 \times 10^9$

**Leaf Dyed Sample**

Organism	Sample without wash (Bacteria Formation)	Sample after 1 wash (Bacteria Formation)	Sample after 2 wash (Bacteria Formation)	Sample after 3 wash (Bacteria Formation)	Sample after 4 wash (Bacteria Formation)
<i>E.coli</i>	$2.5 \times 10^7$	$5.5 \times 10^7$	$7.7 \times 10^8$	$3.3 \times 10^8$	$1.5 \times 10^9$
<i>S.aureus</i>	$3.8 \times 10^7$	$5.7 \times 10^7$	$6.4 \times 10^8$	$2.98 \times 10^8$	$1.5 \times 10^9$

So the neem dyed fabric shows good antimicrobial property up to 4 wash.

**CONCLUSIONS**

The dyes extracted from neem bark & leaf has natural antimicrobial property. The optimum concentration of this dyes when applied on single jersey cotton fabric shows the good antimicrobial property. In this paper, effective eco-friendly antimicrobial property of neem has shown. This finished fabric can be used in underwear, ladies garments, those who work in wet condition. Sustainability of antimicrobial property can be increased in the further research.

**REFERENCES**

1. Anonymous(1985) *The wealth of India – Raw materials. Publication and Information*
2. Directorate, CSIR, New Delhi, India.[1]
3. <https://food.ndtv.com/health/benefits-and-uses-of-neem-a-herb-that-heals-1231051> [2,3]
4. <http://www.fibre2fashion.com/industry-article/4286/antibacterial-finishing-on-woven-cotton-fabrics-with-neem-extract> [4]
5. Sampatrao, DAINGADE AJIT, Metkari Ganesh Sunil, and P. D. Kulkarni. "Performance & Emission Analysis of Biodiesel Using Various Blends (Castor Oil+ Neem Oil Biodiesel)." *Impact Journal 2* (2014): 117-123.
6. Thakkar, P.S., (1997) Editorial notes. *Global Neem Update 2: 1*. [5]
7. Brahmachari, G., (2004) *Neem - an omnipotent plant: a retrospection. Chembiochem 5:*
8. 408-421. [6]
9. Kumar, R.V., Gupta, V.K., (2002) *Thrust on neem is need of today. In: Employment news,*
10. July 20-26. New Delhi, India. [7]
11. Hegde, N.G., (1995) *Neem and small farmers constraints at grass root level. Indian For,*
12. 121: 1040-1048. [8]